

Contributions to Indian Malacology, No. VII. List of species of Unio and Anodonta described as occurring in India, Ceylon and Burma.—By WILLIAM T. BLANFORD, A. R. S. M., F. G. S.

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There are few genera in the whole range of natural history more puzzling than *Unio* and *Anodonta*. Every naturalist who has attended to them has been struck by the great variation of which the different species are susceptible, though it is to be regretted that this knowledge does not appear to have had much influence in restraining some naturalists from recording as distinct species isolated specimens which reached them from distant countries, and which only differed from other specimens in characters of very doubtful specific value.

Although the *Unionidæ* of the Indian waters are far behind those of some countries, and especially of America, in the amount of variation which they exhibit, amply sufficient is shewn to render them very difficult to classify. And as the question of variation is one of the most important, especially at the present day, in the whole range of zoological science, those animals which, in the wild state, exhibit the greatest amount of variation, are peculiarly worthy of study.

In endeavouring to classify the Indian shells, one great difficulty that I have found, has been the determination of described types. Descriptions of Indian *Unionidæ* are scattered through many works, not easily procurable in India. There are, probably, yet a few to which I have not had access, but as I have been able to compile a list, comprising, I believe, a very large majority of the published forms, I think that I shall be aiding any one who, in India, may be engaged in the same study, by printing the list, with references to the original descriptions and to figures, whenever such exist, and by adding such remarks as appear to be necessary.

I also hope to be able to publish figures of a considerable proportion of the species named; in some cases, copies of the original illustrations; in others, drawings of authentic specimens. I shall feel greatly indebted to any one who will aid me in this endeavour by furnishing me with typical forms, or with any specimens from distant parts of the country. In all such cases, a small series of the varieties and different ages is desirable.

The present list, therefore, is merely an instalment of what I hope may be an illustrated monograph of Indian *Unionidæ*.

It is not my intention at present to enter at all fully into the question of the limitation of specific forms. I would merely point out, that some of the described species are certainly within the ordinary limits of variation of others described as distinct. Thus out of one tank in Calcutta, I have taken specimens unquestionably belonging to *U. Corrianus*, Lea, others which were nearer to *U. lamellatus*, Lea, and young specimens representing *U. bilineatus*, Lea, whilst other forms again appeared to appertain to *U. anodontina*, Lam., (or, at least to the species figured as such in Küster's monograph) which by Lea is classed as a variety of *U. marginalis*, Lam. Yet all these forms were unquestionably identical, being united by numerous intermediate varieties, all living together in the same small pond.

Lea's figures in the Journal of the American Philosophical Society, and the Transactions of the Academy of Natural Sciences of Philadelphia, are so good and characteristic, that the difficulties which might otherwise exist in identifying forms discriminated by such minute and variable characters are obviated. Benson's species, of which only descriptions exist, are far more difficult to identify, and Gould's, which are but briefly described, still more so. Küster's monograph, in Martini and Chemnitz's Conchylien Cabinet, contains figures of but few Indian and Burmese Unios, and of those, several are incorrectly named.

For convenience sake, the species of *Unio* inhabiting India proper, Ceylon, Assam, and Burma will be separately enumerated. The species referred to *Anodonta* are so few that subdivision is unnecessary, especially as none occur in India or Ceylon. No typical form of the genus is known to exist in the Indian or Burmese area.

The following works are referred to in the ensuing pages by the abbreviations appended in each case.

Müll.—O. F. Müller, Historia Vermium, 1774 (not procurable in Calcutta).

Chemn. Conch. Cab.—Martini and Chemnitz systematisches Conchylien Cabinet. About 1780? (not procurable in Calcutta).

Gmel.—Caroli a Linne Systemata naturæ. Tom. I, Pars. VI, 1789.

Lam.—Lamarec, Histoire des Animaux sans vertebres, Vol. VI. 1819.

Gleanings in Science, Vol. I., Calcutta, 1829.

Küster, Mart. and Chem.—Systematisches Conchylien Cabinet von Martini und Chemnitz, 2nd edition, by Dr. H. C. Küster and others. Vol. IX. Part 2, commencing in 1843 : unfinished.

Ann. and Mag. Nat. Hist.—The Annals and Magazine of Natural History, London, 3rd series, Vol. X. 1862.

Trans. Am. Phil. Soc.—Transactions of the American Philosophical Society held at Philadelphia, new series, Vol. IV. 1834 ; Vol. V. 1837 ; Vol. VI. 1839 ; Vol. VIII. 1843.

Jour. Acad. Nat. Sci. Phil.—Journal of the Academy of Natural Sciences of Philadelphia, Vol. IV. 1858-60 ; Vol. V. 1862-63.

J. A. S. B.—Journal of the Asiatic Society of Bengal, Vol. III. 1834 ; Vol. IV. 1835 ; Vol. V. 1836.

Proc. Bost. Soc. Nat. Hist.—Proceedings of the Boston Society of Natural History, Vol. I. 1843-44, (not accessible in Calcutta).

Gould, Ot. Conch.—Augustus A. Gould, Otia Conchologica, descriptions of shells and mollusks from 1839 to 1862, Boston, 1862.

S. Hanley, Supp. to Wood's Ind. Test.—Supplement to Wood's Index testaceologicus, 1855 (not accessible in Calcutta).

Genus UNIO, Retzius.

I.—INDIA.

No. 1.—UNIO CORRUGATUS, Müll. sp. Rivers of Coromandel.

Mya corrugata, Müll., p. 214, No. 398.

Unio corrugata, [*a.*] Lam., VI., 78, No. 34.

U. corrugatus, Küster, Mart. and Chem., p. 289, pl. 97, figs. 3, 4.

There is the greatest conceivable confusion about this species and the next one, and it is far from clear what Müller's type was. I cannot obtain access to his work in Calcutta, but Küster copies the description thus :—

Testa rhombea, viridescens, tenera, pellucida ; (umbonibus corrugatis ;) valvulæ intus striis radiantibus subtilissimis notantur.

The figures are, I suppose, those of Chemnitz's types ; they are two in number, one representing the exterior of a subequilateral, nearly elliptical shell, measuring 36 mm. by 24 in its two diameters, and the other the interior of a far more inequilateral shell, also subelliptical, rather smaller than the first, and having every appearance of being a

thick form, with strong lateral teeth. The first shell is subalate posteriorly, and the posterior margin is very bluntly biangulate, the anterior margin is rounded at the end, but the slope thence to the umbo is almost a right line; the second shell is perfectly rounded both before and behind. The shell of which the interior is figured corresponds so ill with Müller's description, being neither rhombic nor thin, that it may certainly be neglected. The figure moreover is ill-executed.

Lamarck's description is a little different from Müller's: "*Unio testâ ovato-rhombeâ, tenui, viridi, umbonibus rugosis, rugis undulato-flexuosis sublongitudinalibus*. Of the variety *a* he adds *testa viridis, pubis carinâ lævigatâ*. His variety *b* is said to be the next species, *U. rugosus*.

The type shell in Mons. de la Serre's cabinet in Paris, which, by the politeness of M. Chenu, the Curator, I was enabled to examine in 1862, is a thin broadly ovate form with small teeth, and a well marked posterior wing. It measures 40 mm. from anterior to posterior margin, and 33 from the umbo to the ventral margin, the latter diameter being thus much greater in proportion to the former than in Küster's type. The valves are inequilateral and much broader behind than before, the anterior margin rounded, sloping away below to the ventral side; posterior margin bluntly biangulate, the two angles rather wide apart. The form is common in Southern India and Ceylon, and appears to have been generally accepted as the type.

Both Lamarck's and Chemnitz's types are quite distinct from Benson's *U. favidens*, which has been confounded with them.

No. 2.—*UNIO RUGOSUS*, Gmelin. Rivers of Coromandel.

Mya corrugata magna, Chemn. Conch. Cab. X. 346, Pl. 170, f. 1659.

M. rugosa, Gmel. p. 3222, No. 32.

Unio corrugata, [b.], Lam. VI., 78, No. 34.

Unio rugosus, Küster, Mart. and Chem. p. 290, Pl. 97, f. 5.

Both this and the preceding species probably inhabit the Cauvery or neighbouring streams. Küster's figure represents an elliptical sub-equilateral shell, with strong angulate sulcation at the umbones, extending to within no great distance of the ventral margin. Gmelin's original description is the following:—

M. testâ ovali rugosâ, extrinsecus virescente, intus margaritaceâ : cardinis dente primario crenulato, laterali longitudinali, alterius duplicato.

No. 3.—*UNIO MARGINALIS*, Lam. Bengal.

Lam. VI. 79, No. 41.

Küster, Mart. and Chem. p. 239, Pl. 80, f. 4.

This species is probably the most widely distributed of all the Indian forms. It is extremely variable, and I am inclined to believe that many of the species to be hereafter enumerated are merely varieties of it. I have examined the type and compared a shell from Pegu with it, which will be figured. It agrees very well. Küster's figure represents a variety with unusually prominent umbones, and rather longer from the hinge to the ventral margin than usual.

U. marginalis is by no means confined to India. It abounds, as I have already mentioned, in Pegu. One of Lamarck's forms came from Ceylon, and Küster appears much disposed to unite to it a species from the Nile in Egypt. Lamarck's type was said to inhabit rice-fields in Bengal.

No. 4.—*UNIO ANODONTINUS*, Lam. Bengal.

U. anodontina, Lam. VI. 80, No. 47.

U. anodontinus, Küster, Mart. and Chemn. p. 240, Pl. 80, f. 5.

Lea has classed this shell as identical with *U. marginalis*, Lam. If Küster's figures in the Conchylien Cabinet can be trusted, the two shells differ more than any one of Lea's three species, *bilineatus*, *lamellatus*, and *Bengalensis* do from each other, or from *marginalis*. Most of the Bengal specimens of *marginalis*, however, are intermediate between the two forms figured by Küster as *marginalis* and *anodontinus*.

The locality given by Lamarck for this species is Virginia. I unfortunately omitted to examine the specimen when I had the opportunity of doing so. There is, I believe, no question but that the shell was really from India.

No. 5.—*UNIO FAVIDENS*, Bens. Ganges valley and Burhampooter valley, Assam.

Benson, Gleanings in Science, I, Pl. 8, f. 1.

„ Ann. Mag. Nat. Hist. 1862, 3rd Ser. X. 188.

This species has been frequently confounded with *U. corrugatus*,

Lam. It differs totally from all the shells referred to that species, and all its numerous varieties are easily distinguished both from Lamarck's and Chemnitz's types of *corrugatus*. *U. favidens* is more inequilateral, it is a thicker shell with much stronger and broader cardinal teeth. The type, too, is more angulate, both anteriorly and posteriorly. The following varieties of *U. favidens*, with their localities, are described by Mr. Benson in the Ann. and Mag. Nat. Hist. Vol. X, pp. 188, 189.

Unio favidens, type. Bhitoura on the Ganges between Cawnpore and Allahabad.

- 1 var. *marcens*,.....Burhampooter river, Assam.
- 2 „ *trigona*,Nujeebabad in the north-west of Rohilkund.
- 3 „ *Deltæ*, Jellinghy river, Bengal.
- 4 „ *Chrysis*,Dojora river, Kareily Ghat near Bareilly.
- 5 „ *viridula*,“Jheel” between Humeerpore and Someerpore, Bundelkund.
- 6 „ *densa*,Ganges river above Chunar.

No. 6.—*UNIO CÆRULEUS*, Lea.—Hoogly river, 100 miles above Calcutta.

Lea, Trans. Am. Phil. Soc. IV, 95, Pl. 13, f. 25.

Benson, J. A. S. B. IV. 450.

Küster, Mart. and Chem. p. 228, Pl. 77, fig. 4.

The two figures agree perfectly. The type is a very thin shell, with fine lamellar teeth. Specimens exist in the Asiatic Society's Museum, brought from Bhagulpoor. The form is widely distributed in N. India; I have even a variety from Sind.

No. 7.—*UNIO BILINEATUS*, Lea. Hoogly river with the last.

Symphonota bilineata, Lea, Trans. Am. Phil. Soc., IV. 98, pl. 11, f. 19.

„ Benson, J. A. S. B. IV. 452.

Benson, (Ann. Mag. Nat. Hist. Ser. 3, Vol. X., pp. 187, 195) shews that this is merely the very young form of *U. marginalis*, Lam. He is unquestionably correct. The “two delicate lines passing from the beaks to the posterior region” are, like many other umbonal markings, characteristic of young shells, and disappear gradually with age. The remains of them, much blunted, are often to be detected on adults.

No. 8.—*UNIO OLIVARIUS*, Lea. Ganges valley.

Lea, Trans. Ann. Phil. Soc. IV, 108, pl. 16, f. 38.

Benson, J. A. S. B. IV. 453.

Küster, Mart. and Chem., p. 244, pl. 82, f. 2.

The locality given by Lea is Burrill river, India. Küster, who appears to be indebted for all his Indian species described by Lea to Dr. von dem Busch, gives Burrill river, Indiana (!), North America, as the locality. Mr. Benson says—"It is widely distributed in the Gangetic region, and is most abundant in the Rohilkund streams." The variety figured by Küster differs from Lea's type is being more inequilateral, much shorter anteriorly, and more obtuse posteriorly, and of a light green colour instead of pale olive. Indeed, it is by no means clear that the specimen figured is not a variety of *U. cæruleus*. I do not know if there be such a river as the Burrill, but the locality for the original type is very probably the neighbourhood of the Burail Range, north of Cachar, as the shell was received by Lea from a Dr. Burrough who collected extensively in Assam, and who supplied the original specimens, from which *Hylobates Hoolock* was described, to Dr. Harland.* This is not far from the localities whence the closely allied *U. Nuttallianus*, Lea, and *U. involutus*, Benson, were obtained.

No. 9.—*UNIO CORRIANUS*, Lea. Calcutta.

Lea, Trans. Am. Phil. Soc. V. 65, pl. 9, fig. 25.

Küster, Mart. and Chem., p. 229, pl. 77, fig. 5.

Two completely distinct shells are figured by the two authorities above referred to. Lea's original type is a young form of one of the common varieties of *marginalis*, approaching *U. anodontina* of Lamarck; Küster's, on the contrary, is a form allied to *U. cæruleus*, but thicker, and with broader hinge teeth than that species, so that it is more diverse from *U. marginalis* than even *cæruleus* is! Küster's specimen was derived from Dr. von dem Busch, who, in this and other instances, appears to have utterly confounded different forms.

* See Transactions of the American Philosophical Society, Vol. IV. p 52. It is a disgrace to the science of England as represented in British India, and a lasting memorial of the disregard of natural history which has always been a characteristic of the British Government of India, that so remarkable an animal as the Hoolock should have been first recognised by an American naturalist at so late a date as 1834. Had India belonged to France, the United States or Russia, the study of its fauna would not have been left to the unaided efforts of private individuals.

No. 10.—UNIO BENGALENSIS, Lea. Bengal.

Lea, Trans. Am. Phil. Soc. VI. 3, pl. 2, f. 3.

Küster, Mart. and Chem., p. 228, pl. 77, f. 2, 3.

In this case again, two totally distinct shells are figured, and again the authority for Küster's appears to be Dr. von dem Busch, whose collection furnished the specimen figured in Martini and Chemnitz. Lea's type is a very peculiar variety of *U. marginalis*, very much "longer" (that is wider when measured from the umbones to the ventral margin) in proportion to the breadth than usual. I have not met with it. It was obtained by Lea from Dr. Burrough who purchased it in Calcutta, and believed that it inhabited the Ganges. It has better claims to distinction than most of Lea's "species."*

Küster's type is a much thicker, more tumid shell, with far stronger teeth and impressed cicatrices, much more inequivalve and different in almost every character. I cannot recognise it as any form with which I am acquainted, and I much doubt its being Indian at all. At all events it is nearer to *U. corrugatus* than to *U. marginalis*.

No. 11.—UNIO LAMELLATUS, Lea. Bengal.

Lea, Trans. Am. Phil. Soc. VI. 19, pl. 6, f. 16.

This is another variety of the *U. marginalis* type, perfectly intermediate between the two last named, and approaching the type more nearly than either. Lea's shells were probably immature. In the younger shells of *marginalis*, the hinge teeth are more lamellar than in the adults, and the principal character of this "species" and of the two preceding is the lamellar teeth.

I have not met with the exact type of this shell, but it doubtless inhabits the neighbourhood of Calcutta. Specimens resembling it in every way except in being rather less long (in the dorso-ventral diameter) in proportion to their breadth are common.

No. 12.—UNIO RAJAHENSIS, Lea. Rajah's Tank, Calcutta.

Lea, Trans. Am. Phil. Soc. VIII., 239, pl. 23, fig. 53.

The above is the locality quoted. I am unable to discover what

* In a letter to my brother, Mr. Benson suggested a doubt as to whether this species were Indian. Taking into consideration the circumstance that nearly all the shells in the Calcutta bazar are foreign, this suggestion appears highly probable.

tank is referred to. The shells inhabiting the Seven Tanks shew a considerable difference. The shell is a small, subrotundate, thick form, approaching some of the varieties of *U. favidens*, Bens., and has much the appearance of being stunted and distorted, a very common occurrence in tanks, and especially in those of Calcutta, probably in consequence of their being slightly brackish at times. Two specimens, agreeing well with Lea's figures, exist in the Asiatic Society's Museum. A very similar shell inhabits the Nerbudda.

No. 13.—*UNIO SHURTLEFFIANUS*, Lea. Sina River, India.

Lea, Jour. Acad. Nat. Sci. Phil. III., 302, pl. 27, f. 17.

The Sina river runs past Ahmednugger in the Deccan. It is an affluent of the Bheema, one of the principal feeders of the Kistna. This shell has somewhat the form of *Unio cæruleus*, but is thicker. Unfortunately the volume containing the description of this shell does not appear to exist in Calcutta, so I cannot tell whether specimens, which I possess from the neighbourhood, belong to the type form or not. In such extremely variable shells as *Unio* this is a matter of considerable importance.

No. 14.—*UNIO MERODABENSIS* v. d. Busch, Province of Merodab in Bengal. (!)

v. d. Busch. MS. in Küster, Mart. and Chem., p. 233, pl. 78, fig. 4.

I give the locality of this ridiculously named species as it is quoted in Küster. The locality is doubtless Moradabad in Rohilcund. Küster gives as a synonym ? *U. flavus*, Benson, and adds the remark: "Whether this species be Benson's described *U. flavus*, I cannot ascertain, as I have not access to Benson's work. The name would be ill-selected, as the shell is by no means yellow."

Of course Benson's species thus referred to is *U. favidens*, of which the present appears to be a variety, very close to Mr. Benson's *var. trigona*. The name *Merodabensis* is so utter a barbarism, that it will be satisfactory to be rid of it. For the little series of blunders attending the description of this type, Dr. v. d. Busch again appears to be responsible.

No. 15.—*UNIO SIKKIMENSIS*, Lea. Sikkim.

Lea, Jour. Acad. Nat. Sci. Phil. 2nd Ser. IV. 251, pl. 39, f. 131.

I have some doubt about the locality assigned to this species. It

approaches the S. Indian forms of the *corrugatus* type (Lamarck's) in outline, and is barely distinguishable from two shells in the Asiatic Society's collection, which are labelled from Ceylon. It is a stouter shell than the Lamarckian *corrugatus*.*

No. 16.—*UNIO NAGPOORENSIS*, Lea. Ambajiri tank, Nagpoor.

Lea, Jour. Acad. Nat. Sci. Phil. Ser. 2, IV. 270, pl. 45, f. 150.

This species is barely separable from some varieties of *Unio favidens*, Bs. It is, however, a rounder, thinner shell, forming a link, both in character and locality, between that species and *Unio corrugatus*.

No. 17.—*UNIO WYNEGUNGAENSIS*, Lea. Wynegunga river, east of Nagpoor.

Lea, Jour. Acad. Nat. Sci. Phil. 2nd Ser. IV, 271, pl. 45, f. 151.

Except in greater thickness, and stouter hinge teeth, there appears no distinction of the slightest importance between this "species" and the last. The type abounds in the Godavery and its feeders, and is, as usual, variable. The locality given by Lea is Wynegunga river, East of Nagpoor in the Deccan, Bengal, which is equivalent to talking of Philadelphia in New England, Virginia. However it is hardly fair to expect American naturalists to have accurate information on Indian geography, when an English naturalist of repute confounds the Khasi hills in N. E. India with the Nilgiris in the S. W., and when a second, in a work solely devoted to Indian zoology, perhaps the most important work on any branch of Indian Natural History, exclusive of botany, ever published in England, confounds Saharunpoor with Serampoor on the Hooghly. After this, the discovery made by the *Times* newspaper, a few years ago, that a spur of the Himalayas is visible from Calcutta is not so surprising. A distinguished French naturalist, five or six years since, placed Kattiarwar in Cochin China, but it is only fair to add that this was before the French expedition to the latter country, and that French naturalists have already done not a little towards making us better acquainted with the Molluscan fauna of that little known region.

* Since writing the above, I have learned that the locality is correct. The shell was collected by Dr. Bacon.

No. 18.—UNIO THECA., Bens. River Cane near Banda, Bundelcund.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X. 186.

I have not seen this form. It belongs, according to Mr. Benson, to the *Corrianus* type of *Unio marginalis*.

No. 19.—UNIO MACILENTUS, Bens. Choia Nuddy, near Bijnore, Rohilcund.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X. 187.

A rather thin species resembling *cæruleus*, but with stout hinge teeth, resembling those of *U. favidens*. I am unacquainted with the type, but a very similar form is common in the Damuda and its tributaries in Bengal.

No. 20.—UNIO TRIEMBOLUS, Bens. R. Ramgunga, near Moradabad.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X. 190.

A thick shell with large hinge teeth. A massive species which inhabits the Nerbudda, and the shells of which are found fossil associated with the bones of extinct mammalia in the gravels of the river valley, may be a variety of this species. I have never seen the type.

No. 21.—UNIO PLAGIOSOMA, Bens. River Cane near Banda, Bundelcund.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X. 191.

No. 22.—UNIO LÆVIROSTRIS, Bens. Near Chunar, in streams and tanks.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X. 191.

No. 23.—UNIO PINAX, Bens. Gungun stream, near Moradabad, Rohilcund.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X. 192.

The three abovenamed species appear all to be allies of *U. favidens*. They probably pass into each other.

No. 24.—UNIO LEIOMA, Bens. Deccan ? near Bombay.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X. 192.

The locality of this shell is uncertain. I have no species from Western India which agrees with the description.

No. 25.—*UNIO OCCATUS*, Lea. Bengal.

Lea, Jour. Acad. Nat. Sci. Phil. 2nd Ser. V. 398, Pl. 50, fig. 304.

A compressed form, with strong teeth, fairly intermediate between *cæruleus* and *favidens*, and allied to *U. macilentus*, Bs. and *U. plagiosoma*, Bs. but more compressed than either. It especially requires comparison with *U. macilentus*, of which it may be a compressed form.

No. 26.—*UNIO GERBIDONI*, Eydoux. Coromandel.

Said by Lea to be the same as *Unio cæruleus*.

No. 27.—*UNIO BONNEAUDI*, Eyd. South India.

No. 28.—*UNIO GAUDICHAUDI*, Eyd. Bengal.

No. 29.—*UNIO KERAUDRENI*, Eyd. Chandernagore.

I am indebted for all my information as to the above four species to Mr. Benson. I have not access at present to the work in which they are described.

In Küster's monograph of *Unio* in Martini and Chemnitz another species is described from the "East Indies," *U. Exanthematicus*, Küster, p. 243, pl. 81, fig. 2. The authority, however, for the locality is Dr. v. d. Busch, whose general accuracy, after the instances given above, may be open to doubt; the "East Indies" in a Natural History sense, not many years since, denoted any country between Africa and Kamschatka, and the peculiar pustulated surface of the shell, from which the name is derived, is unknown in any Indian species. I think it is probably not a native of the Indian Peninsula.

U. discus, Lea, Trans. Am. Phil. Soc. IV, 74, Pl. 18, f. 57, was at first stated to be from India, on, however, palpably insufficient grounds, the original specimen having been purchased from a dealer amongst a lot of shells from India. The shell is so distinct from any known Indian species, that I had concluded that the locality was assigned to it in error, before I found that in a subsequent volume of the Trans. Am. Phil. Soc., Vol. VIII., p. 234, note, Lea mentions his having ascertained that the locality was the River Moctezuma in Central America.

Mr. Benson mentions (Ann. and Mag. Nat. Hist. 1862, X., 195,) his having received from the Malabar Coast a shell which he refers to *U. consobrinus*, Lea.

Unio spuria is said by Lamarek to be from Southern Asia. Mr. Benson states (Ann. and Mag. Nat. Hist. 1862, X., 189,) that the young of *U. favidens* approaches the figure given by Wood of *Mya spuria*, which is, I suppose, the same species. It is not clear that Lamarek's type was Indian. Mr. Benson also (l. c. p. 189) refers to *Mya radiata*, Chem. as being from Malabar. *Mya radiata*, Gmelin is by Lamarek, Lea and Küster, said to be American, and even in Küster I can find no allusion to Chemnitz's species.

It is only right to add too that some of what Woodward most justly terms "the worthless fabrications of Rafinesque" (Man. Mol. p. 136, note,) came from India. No scientific purpose can be served by recalling the names from the oblivion in which they are happily buried.

II.—ASSAM.

No. 30.—UNIO INVOLUTUS, Benson. Assam.

S. Hanley, Supp. to Wood's Ind. Test.

I only know of this and the succeeding three species from reference being made to them by Mr. Benson in the Ann. and Mag. Nat. Hist. for 1862, 3rd Ser. X., 186. The work in which they were originally described is not procurable in Calcutta. *U. involutus* is said to be thin and tumid and to represent *U. olivarius*, Lea, in Assam.

No. 31.—UNIO CORBIS, Bens. Assam.

S. Hanley, Supp. to Wood's Ind. Test.

No. 32.—UNIO RADULA, Bens. Assam.

S. Hanley, Supp. to Wood's Ind. Test.

No. 33.—UNIO SCOBINA, Bens.

S. Hanley, Supp. to Wood's Ind. Test.

U. fluctiger, Lea (teste Benson) Jour. Acad. Nat. Sci. Phil. 2nd Ser. IV, 250, pl. 39, f. 130.

„ Küster, Mart. and Chem., p. 237, pl. 80, fig. 1.

Mr. Benson (in Ann. and Mag. Nat. Hist. 1862, X., 186) states that *U. fluctiger*, Lea, is a synonym of *U. Scobina*. Küster's figure of *fluctiger* differs from Lea's type, and the shell is stated to be from S. America. As, however, Küster's specimen was from Dr. v. d. Busch's cabinet, very little reliance can be placed upon the assigned locality, especially as Lea, who did not know whence the shell came, suggested that it was, possibly, South American.

Küster's type is narrower anteriorly and has rather different, coarser plication posteriorly, than Lea's. It may be a different shell.

No. 34.—UNIO NUTTALLIANUS, Lea. Assam, teste Benson.

Lea, Jour. Acad. Nat. Sci. Phil. III., 310, pl. 30, f. 25.

The locality is simply stated to be India by Lea. Benson, Ann. and Mag. Nat. Hist. 1862, X., 194, states that he has received specimens from Assam. The volume containing the description of this shell is not procurable in Calcutta.

No. 35.—UNIO JENKINSIANUS, Bens. Burhampooter River, Assam.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X., 185.

An ally of *U. marginalis*, distinguished by "the very tumid form, the sloping posterior end, absence of a wing, the short ligament, and the nature and position of the teeth." (Bens. l. c.) In the Asiatic Society's collection there is a shell from Bhagulpoor perhaps referable as a variety to this species.

No. 36.—UNIO PACHYSOMA, Bens. Burhampooter River, Assam.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X., 186.

"An inflated form of the *cæruleus* type." (Bens. l. c.) Mr. Benson also states that he has received a distorted variety from Calcutta. A peculiar tumid form which is not uncommon in Calcutta tanks is doubtless referred to. It agrees generally with the description given. This form therefore adds one more to the Bengal list.

No. 37.—UNIO SMARAGDITES, Bens. Burhampooter River, Assam.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X., 190.

A shell allied to *U. favidens*.

Besides these forms a variety of *U. favidens*, Bens. (*var. marcens*) has already been quoted as occurring in Assam. Mr. Benson also records the receipt of a variety of *U. cæruleus* (J. A. S. B. VI. 750) and of a small variety of *U. marginalis* (Ann. and Mag. Nat. Hist. 3rd Ser. X. 186) from that region.

III.—CEYLON.

No. 38.—UNIO LAYARDI, Lea. Ceylon.

Lea, Jour. Acad. Nat. Sci. Phil. 2nd Ser. IV., 243, pl. 36, f. 122.

This is a shell of the *marginalis* type with a convex dorsal margin, and generally rounded outline. It appears to be a fairly distinguishable form, though very close to *Bengalensis* and *lamellatus*.

No. 39.—*UNIO THWAITESII*, Lea. Ceylon.

Lea, Jour. Acad. Nat. Sci. Phil. 2nd Ser. IV., 246, pl. 37, f. 125.

This shell only differs from the last in having a rather straighter hinge line, and being slightly more inequilateral. If such differences are to rank as specific, half a dozen "species" might be manufactured out of any tank in Calcutta. The separation of these two forms is perfectly unjustifiable in a genus like *Unio*.

The above are the only species that I can trace specially described from Ceylon. Lamarck's variety *b.* of *Unio marginalis* described as *var. testâ minore, brevior*, and 75 millimetres broad was also from Ceylon (Lam. VI. 79). Sir Emerson Tennent, in his work on Ceylon, enumerates only *U. corrugatus* besides *U. marginalis*. He, however, adds that Mr. Cuming possessed six species from the island, which had been sent to Mr. Lea. *U. Thwaitesii* and *U. Layardi* are doubtless two of these, as they were from Mr. Cuming's cabinet, but no mention is made of the others by Mr. Lea.

IV.—BURMA.

No. 40.—*UNIO TAVOYENSIS*, Gould. Tavoy.

Gould, Proc. Bost. Soc. Nat. Hist. I., 140.

„ Ot. Conch. p. 190.

Küster, Mart. and Chem., p. 166, pl. 48, f. 2.

"Closely allied to *U. corrugata*, Lam. which is less rounded and less corrugated" (Gould, l. c.) More nearly allied to Lamarck's than to Chemnitz's type of *U. corrugatus*. Küster's figure agrees well with Gould's description, but represents a young shell, not mature. The specimen figured was from the collection of Dr. Sturm (and not from that of Dr. v. d. Busch).

No. 41.—*UNIO CRISPATUS*, Gould. Tavoy.

U. crispata, Gould, Proc. Bost. Soc. Nat. Hist. I., 141.

„ „ Ot. Conch. p. 191.

No. 42.—*UNIO FOLIACEUS*, Gould. Tavoy.

U. foliacea, Gould, Proc. Bost. Soc. Nat. Hist. I., 141.

„ „ Ot. Conch. p. 191.

An ally (variety?) of *U. marginalis*, Lam. "Closely allied to *U. Bengalensis* and *Corrianus*, Lea." (Gould, l. c.)

No. 43.—*UNIO EXOLESCENS*, Gould. Tavoy.

Gould, Proc. Bost. Soc. Nat. Hist. I., 141.

„ Ot. Conch. p. 191.

Apparently, from the description, another ally or variety of the *U. marginalis* type.

No. 44.—*UNIO GENEROSUS*, Gould. Tavoy.

Gould, Proc. Bost. Soc. Nat. Hist. II., 220.

„ Ot. Conch. p. 201.

I believe I possess this species. Specimens were sent to me by Mr. Theobald from Pegu, which agree with the description fairly, except that they are smaller than the type.

No. 45.—*UNIO LUTEUS*, Lea. Newville, Tavoy.

Lea, Jour. Acad. Nat. Sci. Phil. III., 302, pl. 27, 17.

I have not access to the description or figure of this species.

No. 46.—*UNIO CRISPISULCATUS*, Bens. Bangong R. near Thayet Myo, Pegu.

Benson, Ann. and Mag. Nat. Hist., 1862, 3rd Ser. X., 193.

I am indebted to Mr. Theobald for specimens of this shell. It appears doubtful whether it be more than a variety of *U. crispatus*, Gould, to which Mr. Benson does not refer in his description, and with which he was possibly unacquainted. Gould's description is very brief, and gives the idea of a more coarsely sculptured shell (*“ rugis angulatis radiantibus undique crispata ”*) besides being somewhat shorter (from the dorsal to the ventral margin) in proportion to its breadth, but these are not necessarily specific distinctions.

No. 47.—*UNIO PUGIO*, Bens. Ava and Pegu.

Benson, Ann. and Mag. Nat. Hist., 1862, 3rd Ser. X., 193.

A solitary valve was sent to Mr. Benson by Mr. Theobald, who gave the locality as Ava. I subsequently found the same form in the Myanounng district of Pegu, and Mr. Theobald has since obtained larger varieties, I believe from Prome. It is a well marked type, extremely inequilateral, and with a peculiar acuminate form posteriorly.

As already observed, the type form of *Unio marginalis*, Lam. abounds in Pegu. I found unusually fine specimens in large swamps about Henzada and Myanounng in the Irawady valley. The type gradually passes by insensible gradations into a much less transverse

form, almost subquadrate. The posterior portions of the valves were often covered by the remarkable fresh water Bryozoon. *Hislopia* of Carter, apparently a new species.

I have other species from Pegu, but I am unable at present to compare them with the numerous named forms described by Lea from Siam, many of which probably extend to Burma.

Genus ANODONTA, Brugiere.

No. 1.—ANODONTA SOLENIFORMIS, Bens. Assam.

Benson, J. A. S. B. V., 750.

The type specimen is in the Asiatic Society's Museum (now the Imperial Museum). There is also an *A. soleniformis*, D'Orbigny, but Mr. Benson's name is the oldest, as it was published in 1836.

Mr. Lea has described a species from Siam, evidently very closely allied to this, as *Mycetopus emarginatus*, Lea. (Jour. Acad. Nat. Sci. Phil. 2nd Ser. V., 398, pl. 50, f. 305). As the animal has not been observed, it may be doubtful if it is really a *Mycetopus*. At the same time the character of both the Siam and Assam shells are so distinct from those of any true Anodonta, that perhaps the best provisional classification is that adopted by Mr. Lea. Specimens of *A. soleniformis* with the animal living are a peculiar desideratum.

No. 2.—ANODONTA SALWENIANA, Gould. Salween R., Burma.

Gould, Proc. Bost. Soc. Nat. Hist. I., 158.

„ Ot. Conch. p. 193.

A very peculiar broad shell, belonging to *Monocondylæa*. (See next species.) I have never seen this form.

No. 3.—ANODONTA INOSULARIS, Gould. Salween R., Burma.

Gould, Proc. Bost. Soc. Nat. Hist. I. 158.

„ Ot. Conch. p. 193.

Subsequently in the same volume, p. 161, Dr. Gould suggested that this species might be the type of a new genus which he named *Pseudodon*. This name is by Adams quoted as a synonym of *Anodonta*, but the type species is not quoted under that genus, nor, so far as I can detect, under any other. In *Otia Conchologica*, Gould, in describing the genus, adds in brackets "perhaps equivalent to *Monocondylæa*, D'Orb." So far as the shell is concerned, this is undoubtedly the

correct position of these species, if the hinge teeth are trustworthy indicators of generic affinity. H. and A. Adams, in the Gen. Rec. Moll., include under *Monocondylæa*, *M. Vondenbuschiana*, Lea, from Java,* described by Lea as a *Margaritana* (*Baphia* of Adams) and several species of the genus have been described from Siam and Cochin China by French and American naturalists.

I have received from Mr. Theobald fine specimens obtained in Pegu which correspond admirably with *Margaritana Vondenbuschiana*, Lea, and unquestionably belong, I think, to that species; and also shells which appear to belong to a variety of *Anodonta inoscularis*, agreeing with the type in size, shape and every character of importance; and not only are the two forms unmistakably congeneric, but I even think it probable that specimens might be met with to unite them specifically, as they differ in no essential character, except the very different degree of development of the cardinal tooth, which in *Vondenbuschiana* is scarcely raised, while in the specimens which I refer to *inoscularis* it is sometimes nearly a quarter of an inch high.

There are in the Asiatic Society's collection, also, two forms which appear to me certainly varieties of *M. Vondenbuschiana*. One of them, however, agrees more closely with the figure of *M. Cumingii*, Lea (Jour. Acad. Nat. Sci. Phil. 2nd Ser. IV, 235, pl. 33, f. 114) a Malacca shell, which only differs from *Vondenbuschiana* in unimportant minutiae.

M. Vondenbuschiana is described and figured by Lea in Trans. Am. Phil. Soc. VIII, 222, pl. 18, f. 39, and also in Küster.

Were there nothing but the form of the hinge teeth to connect the South American species of *Monocondylæa* with the Burmese and Javanese *Pseudodon* and *Margaritana*, especially having regard to the very diverse form of the shell, I should suspect them to be in reality distinct types. But there is one little peculiarity which appears to tend to unite them. At the termination of the portion of the hinge line in which, by close inspection, flattened obsolete representations of the lateral teeth may be seen, there is a very peculiar expansion of the end of the ligament which covers a small sinus in the inner surface of both valves. This is very well shewn in Lea's figure of *Margaritana*

* Yet they state, "All the species of this genus known are from the rivers of South America."

Vondenbuschiana, and also in both Adams's figures of different species of *Monocondylæa* from S. America. The same occurs in *Anodon* and in the type species of *Margaritana* of Schumacher,* (*M. margaritifera*, L.). I have not had an opportunity of examining the animals of the Burmese species of *Monocondylæa*, and therefore cannot say if the gills are free or not.

Besides the above forms, a minute species of *Anodon* is stated by Mr. Benson to inhabit ponds in Bundelcund, J. A. S. B., V. 750.

P. S. No. 2a.—*UNIO SPURIUS*, Gm. Tranquebar.

Mya spuria, Gm. vol. I, Pt. VI, p. 3222, No. 16.

Unio spuria, Lam. VI., 80, No. 45.

Mya spuria, Wood, Ind. Test. p. 12, pl. 2, No. 35.

Since writing the note on this species at p. 146, I have found that it was described originally as from India. Gmelin refers to Schroeter Einl. in Conch. II, 617, No. 9, pl. 7, f. 5, so perhaps the name may have been given by Schroeter, though that by no means follows from the reference. The description is very brief: "*M. testâ rhombeâ viridi, natibus glabris*" and the shell is said to be like *corrugatus*, but nearly twice the size and perfectly smooth in front of the beaks ("*praeter vulvæ regionem tota glabra*," Gm. l. c.). Wood's figures are all poor. The shell can scarcely be a young form I think, if considerably larger than *corrugatus*.

Mya radiata,† I find, is attributed to Malabar by Gmelin, (p. 3220,) from whom Wood appears to have only copied his localities. The species is, I think, correctly attributed to Chemnitz by Mr. Benson, although other authors give Gmelin as their authority. Gmelin's description runs thus—" *M. testa æquivalvi pellucida tenuissime transversim striata viridi flavicante livido radiata; valvis altero latere latissimis, altero angustissimis.*" I know of no form of Indian *Unio* to which this description would be applicable, and I cannot help suspecting that the writers who have applied the name to an American species may very possibly be right. Wood's figure, also, does not recall any Indian

* It is by no means clear that *Margaritana* and *Monocondylæa* are more than subgenera, or even artificial sections of *Anodonta*. *M. Vondenbuschiana* is intermediate between the second and last in characters of the shell, and there is no known essential distinction in the animal.

† The Linnæan genus *Mya*, like most Linnæan genera, was an artificial group to some extent. Besides *Mya* as now understood, it comprised *Unio* and several other genera.

species; for it is evident from the above description that the radiating lines shewn do not refer to striæ but to coloured markings. Mr. Benson's shell from Malabar was striated.

Good collections of the Unios of both Coromandel and Malabar are greatly needed to determine all these doubtful species.

MONOCONDYLÆA CREBRISTRIATA, Anthony. Pegu.

American Journal of Conchology, I., 205, pl. 18.

MONOCONDYLÆA PEGUENSIS, Anthony. Pegu.

Am. Jour. Conch. I., 205, pl. 18.

I am indebted to Mr. Theobald for the above quotations. The shells are the two *Monocondylæa* above referred to, the first being that referred by me, though with some doubt, to *Anodonta* (*Pseudodon*) *inoscularis*, Gould, the second to *Monocondylæa Vondenbuschiana*, Lea. So long as it is the practice of naturalists living in foreign countries, and, necessarily, imperfectly acquainted with the fauna of distant regions, to give a "specific" name to every animal or fragment of an animal which reaches them, lists of synonyms must multiply; and as everybody will contend for the distinctness of his "species," false notions as to the nature and value of specific distinctions must prevail. Thus, in the same paper, one of the numerous varieties of *Melania variabilis*, Benson, is called *M. gloriosa*, Anthony. Now it is worthy of remark that Mr. Benson, who has examined far more of the Mollusca of Burma than Mr. Anthony can possibly have seen, has not for years described a single *Melania* from that country as new, and has only described two species of *Unio*, although he had specimens of all Mr. Anthony's supposed new species. I can only add that it would be easy for me to describe, from the materials I possess, 20 or 30 forms of *Unio* (and nearly as many more of *Melania*) with as good claims to distinction as one-half at least of those already published from India and Burma; but were I to do so, I cannot help thinking that, while burdening science with additional names, I should have added nothing to the knowledge of the fresh water mollusca of India. Amongst fresh water shells I am convinced that forms pass into each other far more than amongst land shells, that "species," in the usual definition of the word, have no existence, that all the characters relied upon for distinguishing "species" of *Unionidæ* in especial, the form and thickness of the hinge teeth, form

of the shell, prominence of the umbones, shape of the muscular impressions, colour of the nacre, characters of the epidermis, &c. vary *ad infinitum*—in short that species must be described like genera and grouped around types, not distinguished by characters.

I see from a notice in the Paris *Journal de Conchyliologie* that, in the same volume of the American Journal of Conchology, Mr. Conrad proposed a new genus *Trigonodon* for *Monocondylæa crebristriata* of Anthony, from which, as I have stated above, *Anodonta inoscularis*, Gould, is at the best but dubiously separable specifically. But the last named shell is the type of Gould's genus *Pseudodon*, and Gould himself suggested the identity of that genus with D'Orbigny's *Monocondylæa*.* Unless Mr. Conrad has procured the animals of the Pegu forms, and shewn them to be distinct from those of South America, (and I scarcely think he can have done so,) I cannot believe that any useful object is attained by inventing these generic appellations. Even if *Trigonodon* be not *Pseudodon* over again, (Mr. Conrad appears to have already furnished one synonym before for *Pseudodon*, viz. *Monodontina*,) there has been no distinction of any generic value shewn between the shells of Burmese and Malay species of *Monocondylæa* and those of S. America; and bearing in mind that there are some genera of more restricted distribution than those belonging to the *Unionidæ*, e. g. the Tapir, and amongst Mollusks, *Cyclophorus* and *Megalomastoma*, common to the two regions, it would, I think, be more scientific to examine the animals of the Burmese shells allied to *Monocondylæa*, before founding new genera to comprise them.

There is of course the possibility that Mr. Theobald may have been misinformed as to the respective names of the two species, and that the type of *Trigonodon* is the form I have referred to *Monocondylæa Vondenbuschiana*. I can only add that the specimens of the same shell from the same locality sent to me by Mr. Theobald, do not differ more from Küster's figure of V. d. Busch's original specimen of *M. Vondenbuschiana* in Martini and Chemnitz, than that figure does from Lea's.

UNIO PEGUENSIS, Anthony.

American Journal of Conchology, Vol. I.

I cannot learn what species has been thus named. I hope to be able to refer to the volume before long and to return to the subject.

* Ot. Conch., p. 194.

Two Indian species of *Unio* in the Musée d' Histoire Naturelle at Paris have received MS. names from Valenciennes. I am unable to ascertain at present if these names have been published or not.

Corrigenda in Contributions to Indian Malacology, No. VI., in this volume :

P. 31,	line	2,	from bottom,	for	Kimery	read	Kimety.
32,	"	7,	" top,	"	<i>Fordoni</i>	"	<i>Gordoni</i> .
"	"	8,	" bottom,	"	Hattiwar	"	Kattiawar.
34,	"	2,	" "	"	inwardly	"	conoidly.
35,	"	15,	" top,	"	<i>subgesta</i>	"	<i>subjecta</i> .
37,	"	12,	" bottom,	"	supply "it"	after	nulla.
"	"	9,	" "	"	omit the word South.		
38,	"	10,	" top,	"	oblong ovate, <i>Achatina</i>	read	oblong ovate <i>Achatinæ</i> .
"	"	17,	" "	"	<i>Basilens</i>	"	<i>Basileus</i> .
"	"	12,	" bottom,	"	<i>Alycæus</i>	"	<i>Alycæus</i> .
"	"	8,	" "	"	Recleiz	"	Recluz.
39,	lines	21, 16 & 11,	from bottom,	for	<i>Basilens</i>	"	<i>Basileus</i> .
"	line	17,	from bottom,	for	Wynand	"	Wynaud.
"	"	14,	" "	"	Paulghat cherry	"	Paulghatcherry
"	"	5,	" "	"	of that <i>N. auris</i>	"	of <i>N. auris</i> .
"	"	2,	" "	"	base by	"	barely.
41,	"	11,	" top,	"	slightly	"	slightly.

In the previous number V. of the Contributions, an important error occurs *N. CONULA*, n. s. for *N. CONULUS* (J. A. S. B. XXXIV, 73, 1865).

In the same page, Phoung ditto, Arakan, should be Phoung Do, and three pages further, p. 76, line 12, a semicolon is omitted, altering the sense. The passage should read "a vertical lamina in front, and a second, slightly oblique, just behind; the first giving out" &c. instead of "just behind the first." The only other erratum of importance is in page 81, line 20, where "re-entering lamellar parietal" should be "re-entering parietal lamella."
